§ 98.153 Calculating GHG emissions.

(a) The mass of HFC–23 generated from each HCFC–22 production process shall be estimated by using one of two methods, as applicable:

(1) Where the mass flow of the combined stream of HFC–23 and another reaction product (e.g., HCl) is measured, multiply the weekly (or more frequent) HFC–23 concentration measurement (which may be the average of more frequent concentration measurements) by the weekly (or more frequent) mass flow of the combined stream of HFC–23 and the other product. To estimate annual HFC–23 production, sum the weekly (or more frequent) estimates of the quantities of HFC–23 produced over the year. This calculation is summarized in Equation O–1 of this section:

$$G_{23} = \sum_{p=1}^{n} c_{23} * F_p * 10^{-3} \qquad (\text{Eq. O-1})$$

Where:

G_{23} = Mass of HFC–23 generated annually (metric tons).
c_{23} = Fraction HFC–23 by weight in HFC–23/other product stream.
F_p = Mass flow of HFC–23/other product stream during the period p (kg).
p = Period over which mass flows and concentrations are measured.
n = Number of concentration and flow measurement periods for the year.
10^{-3} = Conversion factor from kilograms to metric tons.

(2) Where the mass of only a reaction product other than HFC–23 (either HCFC–22 or HCl) is measured, multiply the ratio of the weekly (or more frequent) measurement of the HFC–23 concentration and the weekly (or more frequent) measurement of the other product concentration by the weekly (or more frequent) mass produced of the other product. To estimate annual HFC–23 production, sum the weekly (or more frequent) estimates of the quantities of HFC–23 produced over the year. This calculation is summarized in

Equation O–2 of this section, assuming that the other product is HCFC–22. If the other product is HCl, HCl may be substituted for HCFC–22 in Equations O–2 and O–3 of this section.

$$G_{23} = \sum_{p=1}^{n} \left(\frac{c_{23}}{c_{22}} \right) * P_{22} * 10^{-3} \qquad (\text{Eq. O-2})$$

Where:

G_{23} = Mass of HFC–23 generated annually (metric tons).
c_{23} = Fraction HFC–23 by weight in HCFC–22/HFC–23 stream.
c_{22} = Fraction HCFC–22 by weight in HCFC–22/HFC–23 stream.
P_{22} = Mass of HCFC–22 produced over the period p (kg), calculated using Equation O–3 of this section.
p = Period over which masses and concentrations are measured.
n = Number of concentration and mass measurement periods for the year.
10^{-3} = Conversion factor from kilograms to metric tons.

(b) The mass of HCFC–22 produced over the period p shall be estimated by using Equation O–3 of this section:

$$P_{22} = LF * \left(O_{22} - U_{22} \right) \qquad (\text{Eq. O-3})$$

Where:

P_{22} = Mass of HCFC–22 produced over the period p (kg).
O_{22} = mass of HCFC–22 that is measured coming out of the Production process over the period p (kg).
U_{22} = Mass of used HCFC–22 that is added to the production process upstream of the output measurement over the period p (kg).
LF = Factor to account for the loss of HCFC–22 upstream of the measurement. The value for LF shall be determined pursuant to § 98.154(e).

(c) For HCFC–22 production facilities that do not use a thermal oxidizer or that have a thermal oxidizer that is not directly connected to the HCFC–22 production equipment, HFC–23 emissions shall be estimated using Equation O–4 of this section:

$$E_{23} = G_{23} - \left(S_{23} + OD_{23} + D_{23} + I_{23} \right) \qquad (\text{Eq. O-4})$$

Where:

E_{23} = Mass of HFC–23 emitted annually (metric tons).
G_{23} = Mass of HFC–23 generated annually (metric tons).
S_{23} = Mass of HFC–23 sent off site for sale annually (metric tons).
OD_{23} = Mass of HFC–23 sent off site for destruction (metric tons).
D_{23} = Mass of HFC–23 destroyed on site (metric tons).
I_{23} = Increase in HFC–23 inventory = HFC–23 in storage at end of year—HFC–23 in storage at beginning of year (metric tons).

(d) For HCFC–22 production facilities that use a thermal oxidizer connected to the HCFC–22 production equipment, HFC–23 emissions shall be estimated using Equation O–5 of this section:

$$E_{23} = E_L + E_{PV} + E_D \qquad \text{(Eq. O-5)}$$

Where:

E_{23} = Mass of HFC–23 emitted annually (metric tons).
E_L = Mass of HFC–23 emitted annually from equipment leaks, calculated using Equation O–6 of this section (metric tons).
E_{PV} = Mass of HFC–23 emitted annually from process vents, calculated using Equation O–7 of this section (metric tons).
E_D = Mass of HFC–23 emitted annually from thermal oxidizer (metric tons), calculated using Equation O–8 of this section.

(1) The mass of HFC–23 emitted annually from equipment leaks (for use in Equation O–5 of this section) shall be estimated by using Equation O–6 of this section:

$$E_L = \sum_{p=1}^{n} \sum_{t} c_{23} * \left(F_{Gt} * N_{Gt} + F_{Lt} * N_{Lt} \right) * 10^{-3} \qquad \text{(Eq. O-6)}$$

Where:

E_L = Mass of HFC–23 emitted annually from equipment leaks (metric tons).
c_{23} = Fraction HFC–23 by weight in the stream(s) in the equipment.
F_{Gt} = The applicable leak rate specified in Table O–1 of this subpart for each source of equipment type and service t with a screening value greater than or equal to 10,000 ppmv (kg/hr/source).
N_{Gt} = The number of sources of equipment type and service t with screening values greater than or equal to 10,000 ppmv as determined according to § 98.154(i).
F_{Lt} = The applicable leak rate specified in Table O–1 of this subpart for each source of equipment type and service t with a screening value of less than 10,000 ppmv (kg/hr/source).
N_{Lt} = The number of sources of equipment type and service t with screening values less than 10,000 ppmv as determined according to § 98.154(j).
p = One hour.
n = Number of hours during the year during which equipment contained HFC–23.
t = Equipment type and service as specified in Table O–1 of this subpart .
10^{-3} = Factor converting kg to metric tons.

(2) The mass of HFC–23 emitted annually from process vents (for use in Equation O–5 of this section) shall be estimated by using Equation O–7 of this section:

$$E_{PV} = \sum_{p=1}^{n} ER_T * \left(\frac{PR_p}{PR_T} \right) * l_p * 10^{-3} \qquad \text{(Eq. O-7)}$$

Where:

E_{PV} = Mass of HFC–23 emitted annually from process vents (metric tons).
ER_T = The HFC–23 emission rate from the process vents during the period of the most recent test (kg/hr).
PR_p = The HCFC–22 production rate during the period p (kg/hr).
PR_T = The HCFC–22 production rate during the most recent test period (kg/hr).
l_p = The length of the period p (hours).
10^{-3} = Factor converting kg to metric tons.
n = The number of periods in a year.

(3) The total mass of HFC–23 emitted from destruction devices shall be estimated by using Equation O–8 of this section:

$$E_D = F_D - D_{23} \qquad \text{(Eq. O-8)}$$

Where:

E_D = Mass of HFC–23 emitted annually from the destruction device (metric tons).
F_D = Mass of HFC–23 fed into the destruction device annually (metric tons).
D_{23} = Mass of HFC–23 destroyed annually (metric tons).

(4) For facilities that destroy HFC–23, the total mass of HFC–23 destroyed shall be estimated by using Equation O–9 of this section:

$$D_{23} = F_D * DE \qquad \text{(Eq. O-9)}$$

Where:

D_{23} = Mass of HFC–23 destroyed annually (metric tons).
F_D = Mass of HFC–23 fed into the destruction device annually (metric tons).
DE = Destruction Efficiency of the destruction device (fraction).

§ 98.154 Monitoring and QA/QC requirements.

These requirements apply to measurements that are reported under this subpart or that are used to estimate reported quantities pursuant to § 98.153.

(a) The concentrations (fractions by weight) of HFC–23 and HCFC–22 in the product stream shall be measured at least weekly using equipment and methods (e.g., gas chromatography) with an accuracy and precision of 5 percent or better at the concentrations of the process samples.

(b) The mass flow of the product stream containing the HFC–23 shall be measured at least weekly using weigh scales, flowmeters, or a combination of volumetric and density measurements with an accuracy and precision of 1.0 percent of full scale or better.

(c) The mass of HCFC–22 or HCl coming out of the production process shall be measured at least weekly using weigh scales, flowmeters, or a combination of volumetric and density measurements with an accuracy and precision of 1.0 percent of full scale or better.

(d) The mass of any used HCFC–22 added back into the production process upstream of the output measurement in paragraph (c) of this section shall be measured (when being added) using flowmeters, weigh scales, or a combination of volumetric and density measurements with an accuracy and precision of 1.0 percent of full scale or better. If the mass in paragraph (c) of this section is measured by weighing containers that include returned heels as well as newly produced fluorinated GHGs, the returned heels shall be considered used fluorinated HCFC–22 for purposes of this paragraph (d) of this section and § 98.153(b).

(e) The loss factor LF in Equation O–3 of this subpart for the mass of HCFC–22 produced shall have the value 1.015 or another value that can be demonstrated, to the satisfaction of the Administrator, to account for losses of HCFC–22 between the reactor and the point of measurement at the facility where production is being estimated.

(f) The mass of HFC–23 sent off site for sale shall be measured at least weekly (when being packaged) using flowmeters, weigh scales, or a combination of volumetric and density measurements with an accuracy and precision of 1.0 percent of full scale or better.

(g) The mass of HFC–23 sent off site for destruction shall be measured at least weekly (when being packaged) using flowmeters, weigh scales, or a combination of volumetric and density measurements with an accuracy and precision of 1.0 percent of full scale or better. If the measured mass includes more than trace concentrations of materials other than HFC–23, the concentration of the fluorinated GHG shall be measured at least weekly using equipment and methods (e.g., gas chromatography) with an accuracy and precision of 5 percent or better at the concentrations of the process samples. This concentration (mass fraction) shall be multiplied by the mass measurement to obtain the mass of the HFC–23 sent to another facility for destruction.

(h) The masses of HFC–23 in storage at the beginning and end of the year shall be measured using flowmeters, weigh scales, or a combination of volumetric and density measurements with an accuracy and precision of 1.0 percent of full scale or better.